



US009507522B2

(12) **United States Patent**
Chien et al.

(10) **Patent No.:** **US 9,507,522 B2**
(45) **Date of Patent:** **Nov. 29, 2016**

(54) **VIRTUAL KEYBOARD, ELECTRONIC
DEVICE USING THE SAME AND INPUT
METHOD**

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 617 days.

(21) Appl. No.: **12/954,626**

(22) Filed: **Nov. 25, 2010**

(65) **Prior Publication Data**

US 2012/0013533 A1 Jan. 19, 2012

(30) **Foreign Application Priority Data**

Jul. 15, 2010 (TW) 99123232 A

(51) **Int. Cl.**

G06F 3/02 (2006.01)

G06F 3/0489 (2013.01)

G06F 3/0488 (2013.01)

(52) **U.S. Cl.**

CPC **G06F 3/04897** (2013.01); **G06F 3/0202**
(2013.01); **G06F 3/0224** (2013.01); **G06F**
3/04886 (2013.01); **G06F 2203/04809**
(2013.01)

(58) **Field of Classification Search**

CPC G06F 2203/04809

USPC 345/173–178; 715/773

See application file for complete search history.

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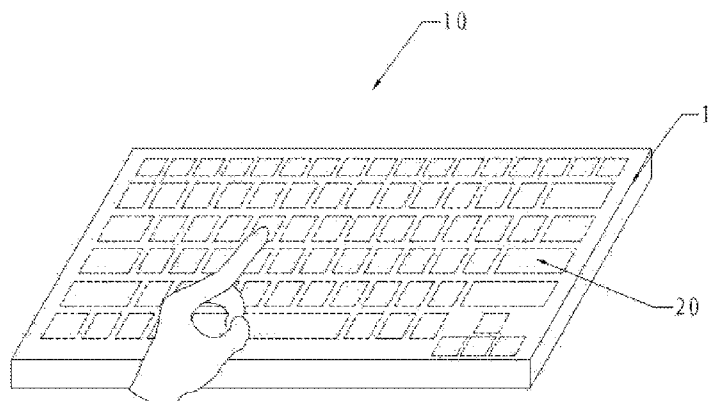
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(57) **ABSTRACT**

A keyboard includes a holographic film having a holographic information of a keyboard arrangement recorded on a surface thereof; a virtual keyboard generated from the holographic film; and a touch panel adjoining the holographic film, configured to detect an information corresponding to a position being touched thereon. The keyboard is of the advantage of multi-function, convenience and portability. An electronic device using the keyboard and an input method are also disclosed.

20 Claims, 5 Drawing Sheets



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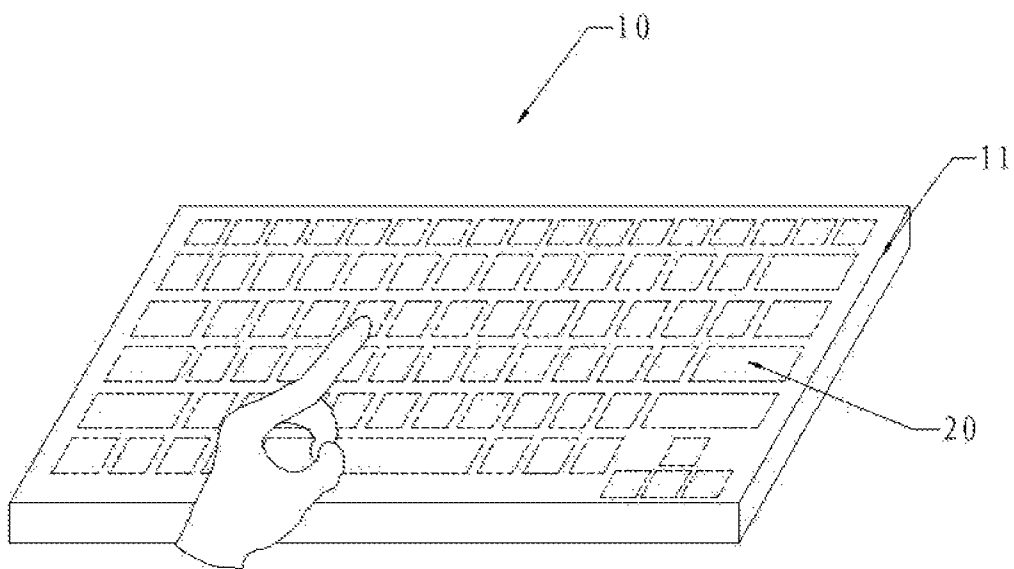


FIG. 1

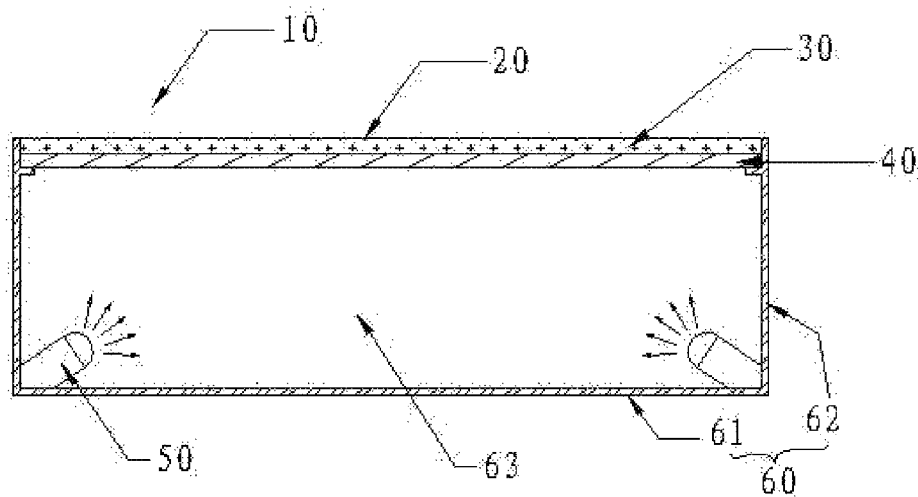


FIG. 2A

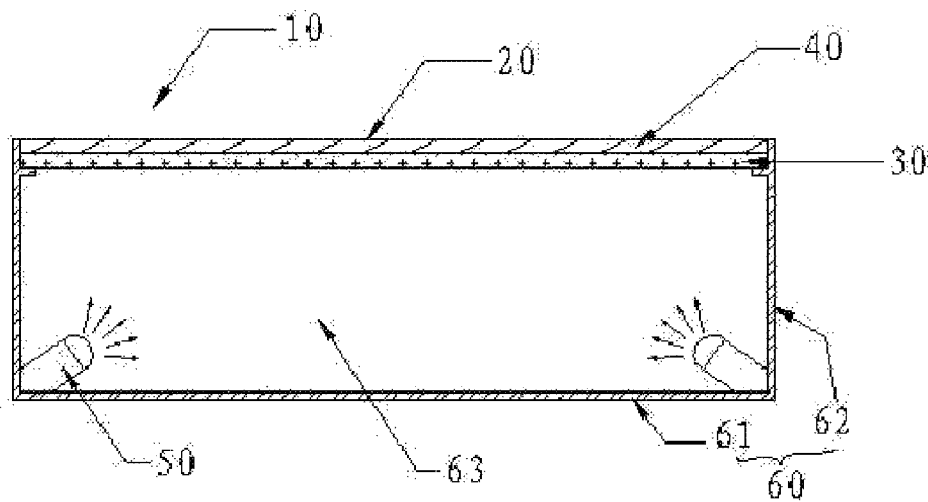


FIG. 2B

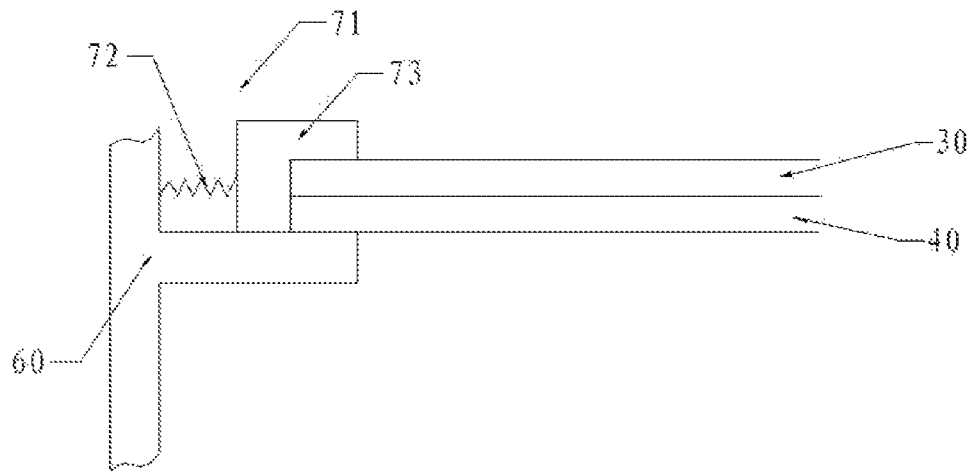


FIG. 3A

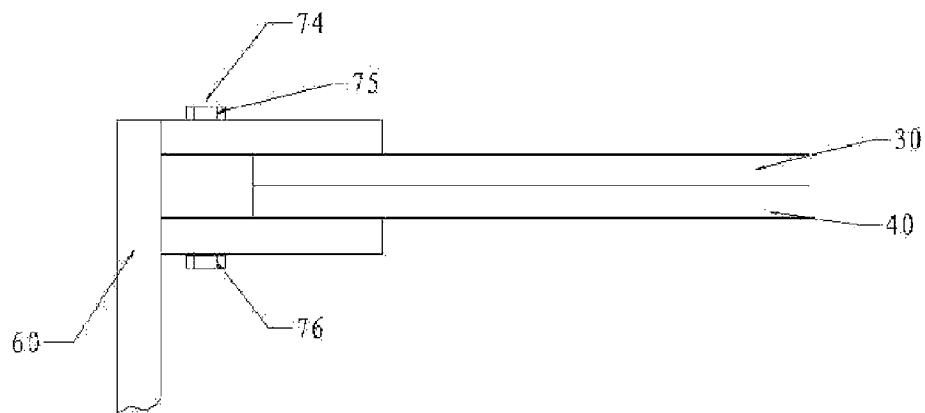


FIG. 3B

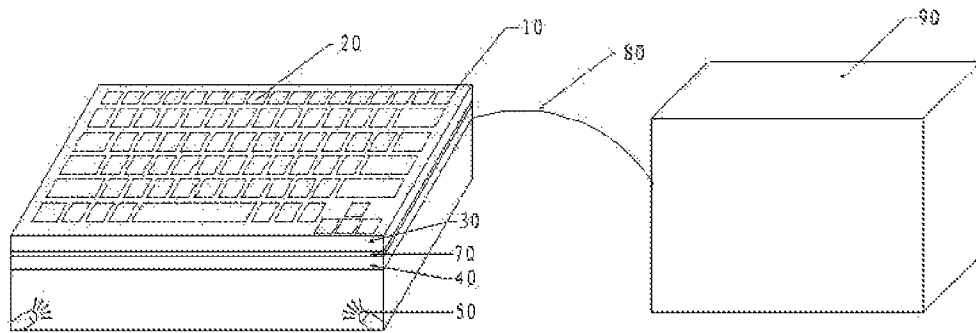


FIG. 4

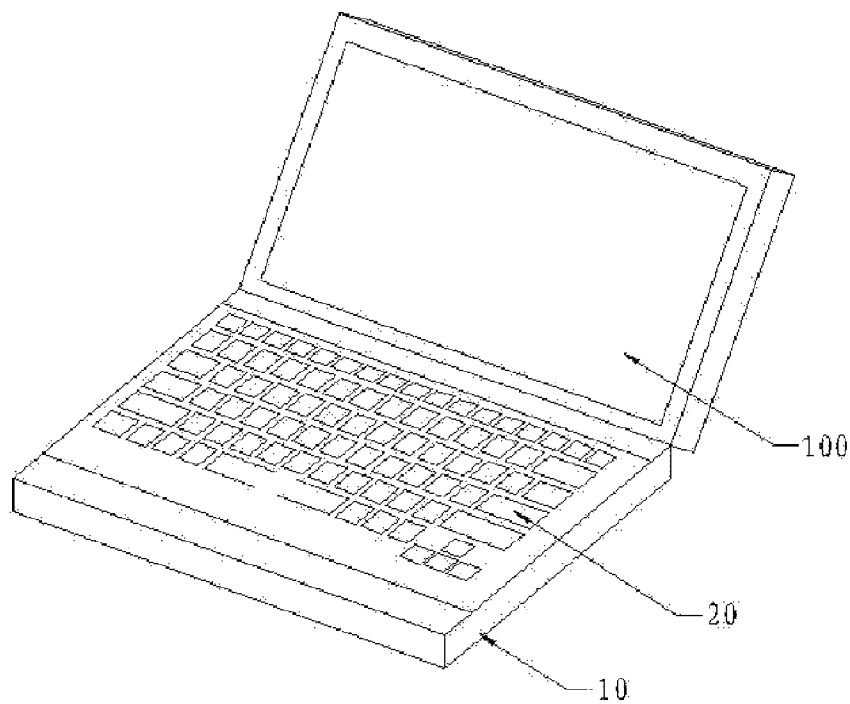


FIG. 5

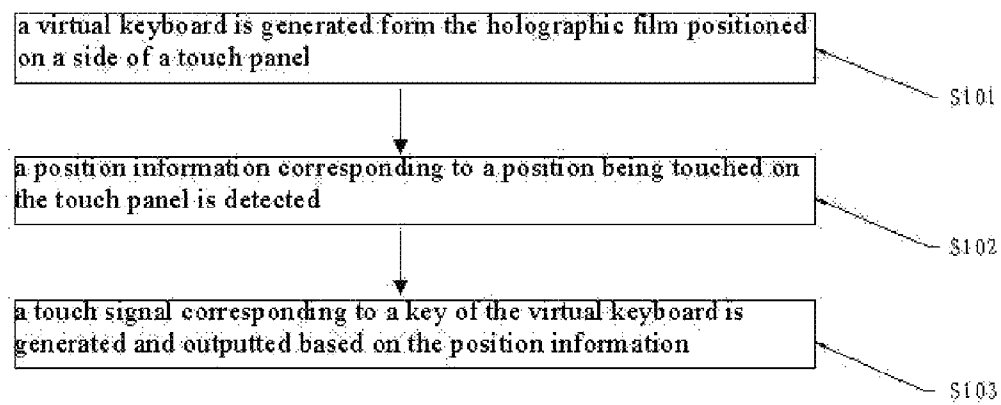


FIG. 6

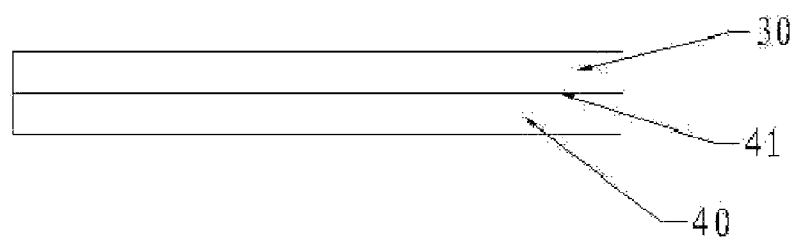


FIG. 7

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VIRTUAL KEYBOARD, ELECTRONIC DEVICE USING THE SAME AND INPUT METHOD

This application claims the benefit of Republic of China (Taiwan) Application No. 099123232, filed on Jul. 15, 2010.

FIELD OF THE INVENTION

The present disclosure relates to a keyboard combining touch sensing technology and holographic technology, an electronic device using the keyboard, and an input method.

BACKGROUND OF THE INVENTION

Nowadays, keyboards are the most important and popular input devices of computer equipments. There are many kinds of keyboards, such as mechanical keyboards, membrane keyboards, conductive rubber keyboards, and capacitive keyboards. These keyboards are usually called physical keyboards, which are made up of separate keys with gaps between them. It is difficult to clean the keyboards, since the dust fall into the gaps and accumulate in the gaps easily. After some time, the dust may lead to failure in the work of keyboard. In addition, they have the defects of poor hand feeling, large noise, and rapid wearing, and with the capacitive keyboard, its manufacturing process is relatively more complicated. Furthermore, it is required to mark symbols (such as letters or characters) on the keys of the physical keyboards in different languages for users from different countries, which would lead to inconvenience in switching among different languages. For example, in this industry, laser engraving is a conventional method of marking symbols on the keys. However, once the letters or characters are engraved, it's hard to make alteration. Furthermore, when a mistake has been made, the whole keyboard has to be redone or scrapped.

In recent years, writing pad becomes another popular input device and it is more convenient using writing pad to input information for some users than aforementioned keyboards. However, it cannot work without a specific stylus. Furthermore, sometimes, the writing pad is always used together with aforementioned keyboards. In this case, these two separate devices will take more space in the workplace.

Thus, there is a need of a new input device to overcome the shortcomings of physical keyboards and writing pads and that which integrates the keyboard with a writing pad and a computer mouse.

SUMMARY OF THE INVENTION

The present disclosure addresses the above problems. The object of the present disclosure is to provide a keyboard based on a touch sensing technology and a holography technology with the advantages of multi-function, convenience and portability.

The present disclosure relates, in one embodiment, to a keyboard. The keyboard includes a holographic film having a holographic information of a keyboard arrangement recorded on a surface thereof; a virtual keyboard generated from the holographic film; and a touch panel adjoining the virtual keyboard. The touch panel is configured to generate a touch signal corresponding to a position being touched on the touch panel through the virtual keyboard.

The present disclosure relates, in another embodiment, to an electronic device. The electronic device includes a host, a keyboard, and a transmission device. The keyboard

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includes a holographic film having holographic information of a keyboard arrangement recorded on a surface thereof; a virtual keyboard generated from the holographic film; and a touch panel adjoining the virtual keyboard. The touch panel is configured to generate a touch signal corresponding to a position being touched on the touch panel through the virtual keyboard; and the transmission device is configured to transmit the touch signal to the host.

The present disclosure relates, in another embodiment, to a method of data input. The method comprises: generating a virtual keyboard from a holographic film positioned on a surface of a touch panel; detecting position information corresponding to a position being touched on the touch panel through the virtual keyboard, and generating and outputting a touch signal corresponding to a key of the virtual keyboard based on the position information.

The keyboard according to the present disclosure combines the multiplex-holography technology with the touch panel. The light beams are projected on the holographic film, such that the virtual keyboard emerges above the holographic film and is close to the touch panel. When users touch the touch panel through the virtual keyboard, the touch panel detects the touching or the gesture at the corresponding position. Therefore, the keyboard can provide striking input, handwriting input, and mouse input (simulate a mouse). The keyboard can serve as a replacement of a writing tablet and/or a mouse.

Symbols of the keyboard arrangement in different language are recorded on holographic film by multiplex-holography technology instead of the conventional laser engraving, such that errors during the engraving can be avoided and, the reproduction of the holographic film is easy, quick, accurate, and of low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

The components in the drawings are not necessarily drawn to scale, the emphasis instead is being placed upon clearly illustrating the principles of the present disclosure. Skilled persons in the art will understand that the drawings, described below, are for illustration purposes only and do not limit the scope of the present invention in any way. Moreover, in the drawings, like reference numerals designate corresponding parts throughout several views.

FIG. 1 is a schematic view of a keyboard in accordance with an embodiment of the present disclosure;

FIG. 2A is a sectional view of the keyboard of FIG. 1 in accordance with an embodiment of the present disclosure;

FIG. 2B is a sectional view of the keyboard of FIG. 1 in accordance with another embodiment of the present disclosure;

FIG. 3A is an enlarged view of a first embodiment of a detachable structure of the keyboard of FIG. 1;

FIG. 3B is an enlarged view of a second embodiment of a detachable structure of the keyboard of FIG. 1;

FIG. 4 is a schematic view of a first embodiment of an electronic device using the keyboard of FIG. 1;

FIG. 5 is a schematic view of a second embodiment of an electronic device using the keyboard of FIG. 1;

FIG. 6 is a flowchart of an embodiment of an input method according to the present disclosure; and

FIG. 7 is an enlarged view of the holographic film and the touch panel of the keyboard of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The disclosure is illustrated by way of example and not by way of limitation to the figures of the accompanying draw-

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ings. The section headings used herein are for organizational purposes only, and are not to be construed as limiting the subject matter described.

Referring to FIG. 1, an embodiment of a keyboard **10** according to the present disclosure is based on a multiplex-holography technology. Keyboard **10** includes a virtual keyboard **20** projected above an upper surface **11**. Users can touch keyboard **10** through the virtual keyboard **20**. The keyboard **10** can sense gesture inputs, such as a single touch action or successive touch actions, and can generate signals corresponding to these gesture inputs and output the signals. Thus, the keyboard **10** can provide a striking input as well as handwriting input, as well as mouse input.

Referring to FIG. 2A, the keyboard **10** further includes a holographic film **30** having holographic information in a keyboard arrangement, a touch panel **40** for detecting touch signals, and light source **50** for projecting light beams. The holographic film **30** is shaped as substantially a plane and is attached to the upper surface of the touch panel **40**.

The holographic film **30** is made of transparent insulation materials, such as glass, emulsion, photonic crystal, or plastic. The holographic film **30** is formed by photographing using a transmission holography technology. During the process of photographing, light beams emitted from a laser source are separated into signal beams and reference beams by a spectroscope. The signal beams and the reference beams are projected on the same side of the holographic film according to the transmission holography technology. After being diffracted and interfered, light waves of the keyboard arrangement carrying the amplitude and phase information of key arrangement and symbols are recorded in the holographic film.

The light source **50** is located under the holographic film **30**. The light source **50** project light beams through the touch panel **40** and onto the holographic film **30**. The holographic film **30** and the light beams cooperatively generate the virtual keyboard **20**. After reconstructing the amplitude and phase information of key arrangement and symbols recorded on the holographic film **30**, the virtual keyboard **20** will emerge above the holographic film **30** vividly. Users can touch the touch panel **40** according to the keyboard arrangement of the virtual keyboard **20** for striking input or gesture input. The size, shape, and relative position of the virtual keyboard **20** match that of the holographic film **30**.

The touch panel **40** is positioned close to the virtual keyboard **20**, for detecting a position being touched on the touch panel **40** and generating touch signals correspondingly. Thus, the size, shape, and relative position of the virtual keyboard **20** matches that of the touch panel **40**.

Referring to FIG. 2B, in an alternative embodiment, the holographic film **30** is disposed under the touch panel **40**, and the light source **50** is located under the holographic film **30**. The light beams from the light source **50** project onto the holographic film **30** and then generate the virtual keyboard **20** above the touch panel **40**. The keyboard **10** in FIG. 2B is of the same working principles with the embodiment shown in FIG. 2A.

When the keyboard **10** serves as an independent device, it may further include a frame **60** to support the components mentioned above. The frame **60** includes a base plate **61** and a plurality of sidewalls **62** extending substantially perpendicular to edges of the base plate **61**. The base plate **61** and the sidewalls **62** corporately define a groove **63** having an open end and a closed end. The touch panel **40** is mounted on the frame **60** positioned at the open end of the groove **63**, and the light source **50** are positioned at the closed end of the groove **63**.

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One can attach the holographic film **30** to the touch panel **40** in different ways. One is to use an adhesive material, such as optical clear adhesive (OCA), to bond the holographic film **30** to the touch panel **40** directly. The other one is to use a mechanical structure, such as a detachable structure, to assemble the holographic film **30** to the touch panel **40**. It should be noted that, the aforementioned methods could be used together in keyboard **10**, if necessary.

The detachable structure mentioned above can be designed to fix the holographic film **30** to the touch panel **40**, using, for example, snap-fitted connection or bolted connection. Referring to FIG. 3A, a snap-fitted structure **71** is mounted on frame **60** to connect to one end of the holographic film **30** and the touch panel **40**. Another snap-fitted structure (not shown) is mounted on the frame **60** to connect to the other end of the holographic film **30** and the touch panel **40**. It is symmetrically designed. The snap-fitted structure **71** includes a sliding snap **73** and an elastic element **72**. It is easy to change the keyboard **10** from one language to another by simply sliding the sliding snap **73** and replacing current holographic film **30** with a new one required. Referring to FIG. 3B, a bolted structure **74** is mounted on the frame **60** to connect to one end of the holographic film **30** and the touch panel **40**. Another bolted structure (not shown) is mounted on the frame **60** to connect to the other end of the holographic film **30** and the touch panel **40**. It is also symmetrically designed. The bolted structure **74** includes a bolt **76** and a nut **75** engaging with the bolt **76** on an upper end thereof. A bottom end of the bolt **76** is fixed. It is easy to change the keyboard **10** from one language to another by simply removing the nut **75** and replacing current holographic film **30** with a new one required.

The touch panel **40** could be a transparent capacitive touch panel, or a resistive touch panel, or an infrared sensing touch panel, or an electromagnetic sensing touch panel, or an acoustic wave sensing touch panel.

The light source **50** can project the light beams onto the holographic film **30** through the touch panel **40**. The touch panel **40** includes a sensing layer **41** (as shown in FIG. 7) made of transparent conductive material. The virtual keys on the virtual keyboard **20** according to the keyboard arrangement correspond to a plurality of sensing units of the sensing layer **41**. The sensing layer in the touch panel **40** detects the contact position being touched on the keyboard **10**.

The light source **50** emitting single color light may be used, such as the Light-Emitting Diodes (LED), Laser Diodes (LD). The keyboard **10** may further include an expender (not shown) disposed in front of the light source **50** for diffusing the light beams. The expender makes the light beams cover the whole surface of the holographic film **30**. The quantity and arrangement of the light source **50** are designed based on practical requirements in terms of providing even and sufficient light beams.

The keyboard **10** can be used in electronic devices, such as desktop computers, laptops, and cell phones. Referring to FIG. 4, a first embodiment of an electronic device includes a host **90**, the keyboard **10**, and a transmission device **80** for transmitting signals to host **90**. In this embodiment, the electronic device is a desktop computer. The transmission device **80** is a transmission wire, such as a Universal Serial Bus (USB) wire or an RS-232 wire. It is to be understood that the transmission device **80** may also use wireless transmission technologies, such as Wireless Fidelity technology (WIFI), Radio Frequency Identification technology (RFID), Infrared technology (IR), or Bluetooth technology.

Referring to FIG. 5, a second embodiment of the electronic device **100** includes the keyboard **10** integrated into a

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host. In this embodiment, the electronic device **100** is a laptop. The keyboard **10** in FIG. **5** used in the laptop **100** is of the same working principle and structure with the first applied embodiment in FIG. **4** described before.

Furthermore, the keyboard **10** can be integrated into a tabletop or a wall to be adapted to different circumstances.

Referring to FIG. **6**, an embodiment of an input method using the keyboard is illustrated.

In step **S101**, a virtual keyboard is generated from the holographic film positioned on an upper or lower surface of a touch panel.

In step **S102**, position information corresponding to a position being touched on the touch panel, through the virtual keyboard, is detected.

In step **S103**, a touch signal corresponding to a key of the virtual keyboard is generated and outputted based on the position information.

When using the keyboard **10**, the first thing is to record both the arrangement and the symbols in required language into the holographic film **30**. When the light, source **50** is powered on, the users can see the virtual keyboard **20** emerging above the holographic film **30**. The arrangement, and the characters of the virtual keyboard **20** are the same as that recorded in the holographic film **30** before. The size and shape of the virtual keyboard **20**. The holographic film **30** is touched by the users at the corresponding symbols and positions on the virtual keyboard **20**. The touch panel **40** detects the position being touched or the gesture made to find out the touch information, to provide striking input, handwriting input and mouse input accordingly.

While certain embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitations.

What is claimed is:

1. A keyboard, comprising:
 - a holographic film having a holographic information of a keyboard arrangement;
 - a light source disposed corresponding to the holographic film;
 - a touch panel adjoining the holographic film, wherein the holographic film is detachably fixed to the touch panel, and the touch panel comprises a touch surface; and
 - a snap-fitted assembly connected to the touch panel and the holographic film, wherein the snap-fitted assembly comprises a snap holding and an elastic element, wherein the snap holds the touch panel and is configured to hold the holographic film; wherein the elastic element abutts the snap, and wherein the snap is slidable to replace the holographic film;
 wherein, when in use, light beams emitted from the light source pass through the holographic film to form a virtual keyboard on the touch surface of the touch panel, the touch panel senses at least one physical touch on the touch surface and generates at least one signal corresponding to the virtual keyboard.
2. The keyboard according to claim 1, wherein the light source is positioned under the holographic film to emit, when in use, single-color light beams to generate the virtual keyboard.
3. The keyboard according to claim 1, wherein a size of the virtual keyboard matches that of the touch surface of the touch panel.

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4. The keyboard according to claim 1, wherein the snap-fitted assembly is disposed on an end of the touch panel and the holographic film.

5. The keyboard according to claim 1, wherein the holographic film is detachably attached to one surface opposite to the touch surface of the touch panel.

6. The keyboard according to claim 1, wherein the holographic film is made of a transparent insulation material.

7. The keyboard according to claim 6, wherein the transparent insulation material is made of glass, emulsion, photonic crystal or plastic.

8. The keyboard according to claim 1, wherein the holographic film is formed by photographing using a transmission holography technology.

9. The keyboard according to claim 2, wherein the light source is a light emitting diode or a laser diode, and the light beams are single color light.

10. The keyboard according to claim 2, further comprising an expender disposed in front of the light source.

11. The keyboard according to claim 1, wherein the touch panel is a resistive touch panel, a capacitive touch panel, an infrared sensing touch panel, an electromagnetic sensing touch panel, or an acoustic wave sensing touch panel.

12. The keyboard according to claim 1, wherein the touch panel comprises a touch sensing layer.

13. The keyboard according to claim 12, wherein the touch sensing layer comprises a transparent conductive material.

14. The keyboard according to claim 2, further comprising a frame, wherein the touch panel is mounted on the frame and the light source is positioned under the touch panel.

15. The keyboard according to claim 1, wherein the touch panel comprises a touch sensing layer comprising a plurality of sensing units, and a plurality of virtual keys of the virtual keyboard correspond to the plurality of sensing units.

16. An input method, comprising:
 providing a holographic film of a keyboard having a holographic information of a keyboard arrangement and a light source of the keyboard disposed corresponding to the holographic film;
 emitting light beams from the light source to pass through the holographic film to generate a virtual keyboard, wherein the virtual keyboard is positioned on a touch surface of a touch panel of the keyboard, and wherein the holographic film is detachably fixed to the touch panel, and wherein the keyboard comprises a snap-fitted assembly connected to the touch panel and the holographic film, wherein the snap-fitted assembly comprises a snap holding the touch panel and the holographic film and an elastic element abutting the snap, and the snap is slidable to replace the holographic film;
 sensing at least one physical touch on the touch surface by the touch panel; and
 generating at least one signal corresponding to the virtual keyboard.

17. The input method according to claim 16, wherein the touch panel comprises a touch sensing layer comprising a plurality of sensing units, and a plurality of virtual keys of the virtual keyboard correspond to the plurality of sensing units.

18. The input method according to claim 16, wherein the light source is positioned under the holographic film to emit, when in use, single-color light beams to generate the virtual keyboard.

19. The input method according to claim 16, wherein the snap-fitted assembly is disposed on an end of the touch panel and the holographic film.

20. The input method according to claim 16, wherein the holographic film is detachably attached to one surface 5 opposite to the touch surface of the touch panel.

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